VALENTINA MAZZOTTI

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RESEARCH & WORK EXPERIENCE

2024 – 2026 **MSc IN PHYSICS** **McGill University - Montréal, QC**

Ultrafast THz Spectroscopy Laboratory – Prof. Dr. David G. Cooke

- My research focuses on probing the dynamics of polaron formation in all-inorganic perovskites, specifically $CsPbBr_3$ and $Cs_2AgBiBr_6$, using ultrabroadband terahertz spectroscopy.
- Analyzing the impact of polaron dynamics on charge carrier mobility and scattering, with the goal of enhancing the design of optoelectronic materials for energy conversion.
- Operate and maintain a THz Time-Domain Spectroscopy (THz-TDS) and Time-Resolved Terahertz Spectroscopy (TRTS) setup, as well as perform pump-probe experiments.
- Utilize various time-resolved systems, including an all air-plasma THz spectrometer with sub-50 fs and sub-meV resolution.

10/2023 - 8/2024 **HONOURS THESIS & RESEARCH ASSISTANT** **Stewart Blusson Quantum Matter Institute - UBC**

Hallas Lab – Prof. Dr. Alannah Hallas

- My Honours Thesis focused on investigating the structural stability and magnetic properties of pyrochlore compounds $Li(Ga,In)Cr_4O_8$
- Gained proficiency in VASP, Quantum Espresso, and Wannier90, applying *ab-initio* methods to study these systems.
- Developed a computational approach that combined DFT ground-state energy calculations with Wannierization and a first-principles linear-response approach to resolve magnetic exchange interactions.
- Identified key factors influencing structural stability and elucidated how magnetic properties impact strucural stability.

12/2021 – 05/2024 **ENERGY SYSTEM DESIGNER & SOFTWARE DEVELOPER** **Sustaingineering – UBC**

Member of the Electrical and Software Team of Sustaingineering, which is an Engineering Design Team at UBC with the goal of motivating students to act on global sustainability issues through technology.

- Designed and assembled a hybrid renewable energy system for the Sustainable Mobile Research Testbed (SMRT) project, incorporating solar panels, batteries, and control components to create an off-grid mobile home.
- Developed a web application for remote monitoring, capturing data for real-time monitoring of a water pump system in Nicaragua.

05/2023 – 08/2023 **SUMMER RESEARCH ASSISTANT** **Stewart Blusson Quantum Matter Institute - Vancouver, BC**

Hallas Lab – Prof. Dr. Alannah Hallas

- Developed a data-driven framework to predict properties in high-entropy oxides and intermetallic materials for guiding materials synthesis.
- Conducted *ab-initio* calculations of electronic properties via density functional theory using VASP and Quantum Espresso on high-performance computing (HPC) clusters.
- Applied Machine Learning techniques to the Cluster Expansion Formalism to derive effective energy models for these systems.
- Wrote Monte Carlo simulations in Python to study finite thermodynamic properties of intermetallic systems.

05/2022 – 09/2022 **SUMMER RESEARCH ASSISTANT** **Max-Planck-Institute for Solid State Research – Stuttgart, Germany**

Member of the Kaiser Group, where the primary research focus lies in the study strongly correlated electron materials and novel quantum materials via ultrafast spectroscopy techniques.

- Built a pump-probe and pump-pump-probe setup to study Ta_2NiSe_5, a semimetal with exciton insulator transition, and $2H-NbSe_2$.
- Acquired knowledge and expertise in advanced nonlinear optical methods, particularly ultra-broadband pump-probe spectroscopy.
- Conducted data analysis on beamtime data using Origin and Python.
- Converted the control software for a lock-in amplifier from LabVIEW to Python.

05/2021 – 09/2021 **RESEARCH ASSISTANT AND SOFTWARE DEVELOPER** **Stewart Blusson Quantum Matter Institute - Vancouver, BC**

Member of the ARPES group under the supervision of Dr. Andrea Damascelli; the lab focuses on studying the structural, electronic, and magnetic properties of novel complex systems and nanostructured materials.

- Developed a Python-based Graphical User Interface (GUI) to facilitate the tracking of micrometer-sized samples within the ARPES spectrometer.
- Collaborated on hardware implementations necessary for precise sample positioning during laser-based photoemission experiments on cuprates.

06/2019 – 07/2019 **HIGH SCHOOL RESEARCH INTERNSHIP** **Max-Planck-Institute for Astronomy – Heidelberg, Germany**

- Research activity in groups, concerning the analysis and study with Python and C++ of the orbit of the star S2 using data from the Sloan Digital Sky Survey.

05/2019 – 06/2019 **INTERNSHIP AT IBM** **IBM Studios - Milan, Italy**

- Information session about the IT world, Cognitive computing and Big Data.
- Creation of a Chatbot using Watson Assistant on the IBM Bluemix platform.

EDUCATION

09/2024 - 08/2026 **McGill University - Montréal, Canada** **Master of Science**
Physics (Thesis)

09/2020 - 05/2024 **University of British Columbia - Vancouver, Canada** **Bachelor of Science**
Combined Honours in Physics and Computer Science

09/2015 - 07/2020 **Liceo Scientifico Alessandro Volta - Milan, Italy** **High School Diploma**
Subjects: Maths, Physics, Science (Biology, Chemistry, Earth science), Italian, English, History, Philosophy, Latin, Technical Design, PE

LANGUAGES

Italian, German - Fluent

English - Proficient

French - Advanced

Spanish - Intermediate

DIGITAL SKILLS

Programming Languages: Python, C++, C, Java, Julia, Lua, MATLAB

Ab-initio DFT softwares: VASP, Quantum Espresso and Wannier90 simulation packages

Scripting and Automation: Bash on Linux

HPC: High-Performance Computing

Web Development: Node.js (Back-End), HTML, CSS, JavaScript (Front-End)

UI/UX Design: Figma, Canva

Website Building: Wix

Microcontroller Programming: Arduino

VOLUNTEERING & EXTRACURRICULAR ACTIVITIES

08/2024 – current **Physics Public Talks and Social Media Coordinator**
McGill University - Montréal, Canada
I am currently organizing public talks for the Department of Physics, including speaker recruitment, venue setup, and event promotion. I am also responsible for creating and managing content for social media, highlighting research and advertising department wide events. I am also part of the EDI and the Outreach committee of the Physics Department of McGill university.

08/2024 – current **Graduate Mentor for the Scientista Mentorship Program**
McGill University - Montréal, Canada
I am currently mentoring an undergraduate Math-Physics McGill Student as part of the Scientista Mentorship Program.

03/2024 **Science Slam Presenter**
Undergraduate Science Slam - University of British Columbia – Vancouver, Canada
I participated in the first Canadian Undergraduate Science Slam, where I explained the Second Law of thermodynamics to a diverse audience, making the concept accessible and engaging to people from various backgrounds.

09/2023 – 05/2024 **PHYS 304 (Introduction to Quantum Mechanics) Tutor**
University of British Columbia – Vancouver, Canada
I tutored students in an intermediate-level quantum mechanics course (PHYS) offered at UBC, covering conceptual explanations and assisting with problem-solving questions.

06/2023 – 10/2023 **Marketing Director for the Q-SITE Conference**
Q-SITE (Quantum – Science, Information, Technology, and Engineering) Conference
As Marketing Director for Canada's first student-led undergraduate quantum conference, held simultaneously at UBC and the University of Toronto, I led the promotion of the event, which focused on quantum information science and its multidisciplinary applications. I managed the conference website and all social media platforms

10/2021 – 12/2023 **SOCIAL MEDIA LEAD OF THE SAC**
Student Council of the Canadian Association of Physicists
Organized student-focused events such as problem-solving competitions, hackathons, and lecture series. I managed social media content, including a monthly journal series on breakthrough discoveries in physics.

09/2023 – 05/2024 **Member of the UBC Quantum Club**
University of British Columbia – Vancouver, Canada

03/2019 – 05/2019 **VOLUNTEER EXHIBITION COORDINATOR**
Menotti Theatre - Milan, Italy
Co-organized activities for an annual Physics Festival in European theaters, focusing on the history of the Copenhagen school, alongside physicist Gabriella Greison.

CONFERENCES & WORKSHOPS

10/2024 **ALLS/TrUST Workshop**
Bibliothèque et Archives nationales du Québec- Montréal, Canada
Poster presentation on "Probing Polaron Formation Dynamics in All-Inorganic Perovskites."

03/2024 **Multidisciplinary Undergraduate Research Conference (MURC 2024)**
University of British Columbia – Vancouver, Canada
Oral presentation on "Computational Investigation of Stability and Magnetism in Breathing Pyrochlores."

06/2022 **16th Canadian Powder Diffraction Workshop (CPDW)**
University of British Columbia – Vancouver, Canada
Attended a week-long workshop focused on the fundamental theory and practical applications of powder and 2D diffraction techniques for materials analysis. The workshop included lectures on diffraction theory and hands-on training with software tools used for analyzing diffraction patterns.

AWARDS AND HONOURS

Work Learn International Undergraduate Research Award (WLIURA) 2024

Faculty of Science International Student Scholarship 2023

Work Learn International Undergraduate Research Award (WLIURA) 2023

Faculty of Science International Student Scholarship 2022

The Erich Vogt First Year Summer Research Experience (FYSRE) Award Recipient 2021

Quantum Pathways Scholarship Recipient 2021-2024

Faculty of Science International Student Scholarship 2021

UBC Academic Awards: Outstanding International Student Award (Vancouver)

DOTE SCUOLA 2020 High School Award

L. Feng, J. Cao, T. Priessnitz, Y. Dai, T. Oliveira, J. Yuan, R. Oka, M.-J. Kim, M. Chen, A. Ponomaryov, I. Ilyakov, H. Zhang, Y. Lv, V. Mazzotti, G. Kim, G. Christiani, G. Logvenov, D. Wu, Y. Huang, and H. Chu, *Dynamical interplay between superconductivity and charge density waves: A nonlinear terahertz study of coherently driven 2H-NbSe2*, **108**, L100504 (2023), *Physical Review B*, DOI: 10.1103/PhysRevB.108.L100504.

Sydney K. Y. Dufresne, Sergey Zhdanovich, Matteo Michiardi, Bradley G. Guislain, Marta Zonno, Valentina Mazzotti, Lauren O'Brien, Sean Kung, Giorgio Levy, Arthur K. Mills, Fabio Boschini, David J. Jones, and Andrea Damascelli, *A versatile laser-based apparatus for time-resolved ARPES with micro-scale spatial resolution*, **95**(3), 033907 (2024), *The Review of Scientific Instruments*, DOI: 10.1063/5.0176170.